The OSIRIS Concept for Ocean Salinity Sensing

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Abstract

The Ocean salinity/Soil moisture Integrated Radiometric Imaging Sensor (OSIRIS) is a combined passive and active sensing concept designed to operate at 1–3 GHz, using a large (~6-m-diameter), low-mass, deployable mesh antenna. Over the ocean, radiometric measurements provide the primary information on Sea Surface Salinity (SSS) and Sea Surface Temperature (SST), while the scatterometer measurements provide primary information on wind-induced surface roughness for correcting the radiometric measurements. Simulations indicate that a 6-m antenna radiometer-scatterometer system can accurately map the large scale SSS field and seasonal to interannual variability. Measurement errors at 100-km spatial resolution and weekly to monthly time scales, including various ionosphere, atmosphere, and surface corrections, will be less than 0.2 psu global average, and about 0.1 psu in the tropics. The antenna system consists of a rotating, offset-fed parabolic reflector, with multichannel feedhorns shared by radiometer and radar subsystems in one sensor package. The system measures microwave emission and backscatter from the Earth's surface, effectively simultaneously, at multiple frequencies and polarizations. The reflector surface is a gold-plated molybdenum wire mesh supported by a rigid structure that can be folded compactly for launch and deployed on orbit. A key feature of the large antenna concept is the potential for including higher frequencies by increasing the number of feedhorns at the reflector focus. This expands the potential applications to include ocean wind speed and direction, precipitation, sea-ice, snow depth, and other environmental parameters at significantly higher spatial resolutions than are currently feasible.